CLAIMS

1. A planarizing machine, comprising:

a table having a support surface;

a processing pad on the support surface;

a carrier assembly having a head configured to hold a microelectronic workpiece and a drive assembly carrying the head relative to the support surface; and

a solution dispenser separate from the head, the solution dispenser being configured to discharge a planarizing solution onto a plurality of locations on the pad.

2. The planarizing machine of claim 1 wherein the solution dispenser comprises:

an elongated support extending over the pad at a location spaced apart from a travel path of the head;

a fluid passageway carried by the support through which a planarizing solution can flow; and

a plurality of nozzles carried by the support, the nozzles being in fluid communication with the fluid passageway to create a plurality of flows of planarizing solution that are discharged onto separate locations on the processing pad.

3. The planarizing machine of claim 1 wherein the solution dispenser comprises:

an elongated support extending over the pad at a location spaced apart from a travel path of the head;

a fluid passageway carried by the support through which a planarizing solution can flow; and

an elongated slot extending along at least a portion of the support, the slot being in fluid communication with the fluid passageway to create an elongated flow of planarizing solution.

4. The planarizing machine of claim 1 wherein the solution dispenser comprises an elongated support extending over the pad at a location spaced apart from a travel path of the head, a channel along at least a portion of the support through which a planarizing solution can flow, and a lip along at least a portion of the channel over which the planarizing solution can flow.

5. The planarizing machine of claim 1 wherein the solution dispenser comprises:

an elongated support extending over the pad at a location spaced apart from a travel path of the head, the support having a first section and a second section;

a fluid passageway carried by the support through which a planarizing solution can flow;

a first fluid discharge unit at the first section of the support, the first discharge unit being configured to discharge a first flow of the planarizing solution onto a first location of the pad; and

a second fluid discharge unit at the second section of the support, the second discharge unit being configured to discharge a second flow of the planarizing solution onto a second location of the pad, wherein the first and second fluid discharge units are independently controllable from one another.

6. The planarizing machine of claim 1 wherein the solution dispenser comprises:

an elongated support extending over the pad at a location spaced apart from a travel path of the head, the support having a first section and a second section;

a fluid passageway carried by the support through which a planarizing solution can flow;

a first nozzle at the first section of the support, the first nozzle being in fluid communication with the fluid passageway to discharge a first flow of the planarizing solution onto a first location of the pad; and

a second nozzle at the second section of the support, the second nozzle being in fluid communication with the fluid passageway to discharge a second flow of the planarizing solution onto a second location of the pad, wherein the first and second fluid discharge units are independently controllable from one another.

7. The planarizing machine of claim 1 wherein the solution dispenser comprises:

an elongated support extending over the pad at a location spaced apart from a travel path of the head;

a fluid passageway carried by the support through which a planarizing solution can flow; and

a fluid discharge unit slidably carried by the support and in fluid communication with the fluid passageway, the fluid discharge unit being moveable along the support to discharge a flow of the planarizing solution onto separate areas of the processing pad.

8. The planarizing machine of claim 1 wherein the solution dispenser comprises:

a support extending over the pad at a location spaced apart from a travel path of the head;

a fluid passageway carried by the support through which a planarizing solution can flow; and

a nozzle carried by the support and in fluid communication with the fluid passageway, the nozzle being rotatably coupled to the support.

9. The planarizing machine of claim 1, further comprising:

a temperature sensor to sense a temperature of a contact surface of the processing pad;

a valve coupled to the flow of the planarizing solution; and

a controller coupled to the temperature sensor and the valve, wherein the controller causes the valve to adjust the flow rate of the planarizing solution through the dispenser according to the temperature sensed by the temperature sensor.

10. The planarizing machine of claim 1, further comprising:

a pressure sensor to sense a pressure between the workpiece and a contact surface of the processing pad;

a valve coupled to the flow of the planarizing solution; and

a controller coupled to the pressure sensor and the valve, wherein the controller causes the valve to adjust the flow rate of the planarizing solution through the dispenser according to the pressure sensed by the pressure sensor.

11. The planarizing machine of claim 1, further comprising:

a drag sensor to sense a drag force between the workpiece and a contact surface of the processing pad;

a valve coupled to the flow of the planarizing solution; and

a controller coupled to the drag sensor and the valve, wherein the controller causes the valve to adjust the flow rate of the planarizing solution through the dispenser according to the drag force sensed by the drag sensor.

12. A planarizing machine, comprising:

a table having a support surface;

a processing pad on the support surface;

a carrier assembly having a head configured to hold a microelectronic workpiece and a drive assembly carrying the head; and

a solution dispenser separate from the head, the solution dispenser having a support extending over the pad and a distributor carried by the support, the distributor being configured to discharge a planarizing solution from a plurality of locations along the support.

13. The planarizing machine of claim 12 wherein:

the support comprises an elongated arm and a fluid passageway carried by the arm through which a planarizing solution can flow; and

the distributor further comprises a plurality of nozzles carried by the arm, the nozzles being in fluid communication with the fluid passageway to create a plurality of flows of planarizing solution that are discharged onto a plurality of locations on the processing pad.

14. The planarizing machine of claim 12 wherein:

the support comprises an elongated arm and a fluid passageway carried by the arm through which a planarizing solution can flow; and

the distributor further comprises an elongated slot along at least a portion of the arm, the slot being in fluid communication with the fluid passageway to create an elongated flow of planarizing solution.

15. The planarizing machine of claim 12 wherein:

the support comprises an elongated arm and a channel along at least a portion of the arm through which a planarizing solution can flow; and

the distributor further comprises a weir along at least a portion of the channel over which the planarizing solution can flow.

16. The planarizing machine of claim 12 wherein:

the support comprises an elongated arm and a fluid passageway carried by the arm through which a planarizing solution can flow, the arm having a first section and a second section; and

the distributor further comprises a first fluid discharge unit at the first section and a second fluid discharge unit at the second section, the first discharge unit being configured to discharge a first flow of the planarizing solution onto a first location of the pad, and the second discharge unit being configured to discharge a second flow of the planarizing solution onto a second location of the pad, wherein the first and second fluid discharge units are independently controllable from one another.

17. The planarizing machine of claim 12 wherein:

the support comprises an elongated arm and a fluid passageway carried by the arm through which a planarizing solution can flow, the arm a first section and a second section; and

the distributor further comprises a first nozzle at the first section and a second nozzle at the second section, the first nozzle being in fluid communication with the fluid passageway to discharge a first flow of the planarizing solution onto a first location of the pad, and the second nozzle being in fluid communication with the fluid passageway to discharge a second flow of the planarizing solution onto a second location of the pad, wherein the first and second fluid discharge units are independently controllable from one another.

18. The planarizing machine of claim 12 wherein:

the support comprises an elongated arm and a fluid passageway carried by the arm through which a planarizing solution can flow; and

the distributor further comprises a fluid discharge unit slidably carried by the arm and in fluid communication with the fluid passageway, the fluid discharge unit being moveable along the arm to discharge a flow of the planarizing solution along different areas of the processing pad.

19. The planarizing machine of claim 12 wherein:

the support comprises an elongated arm and a fluid passageway carried by the arm through which a planarizing solution can flow; and

the distributor further comprises a nozzle carried by the arm and in fluid communication with the fluid passageway, the nozzle being rotatably coupled to the arm.

20. A planarizing machine, comprising:

a table having a support surface;

a processing pad on the support surface;

a carrier assembly having a head configured to hold a microelectronic workpiece and a drive assembly carrying the head; and

a solution dispenser having support above the pad and a nozzle moveably coupled to the support, the nozzle being coupleable to a planarizing solution.

21. The planarizing machine of claim 20 wherein:

the support comprises an elongated arm and a fluid passageway carried by the arm through which a planarizing solution can flow; and

the nozzle is slidably carried by the arm and in fluid communication with the fluid passageway.

22. The planarizing machine of claim 20 wherein:

the support comprises an elongated arm and a fluid passageway carried by the arm through which a planarizing solution can flow; and

the nozzle is rotatably coupled to the arm.

23. A planarizing machine, comprising:

a table having a support surface;

a processing pad on the support surface;

a carrier assembly having a head configured to hold a microelectronic workpiece and a drive assembly carrying the head; and

a solution dispenser separate from the head, the dispenser having a support above the pad and a plurality of nozzles carried by the support, the nozzles being coupleable to a planarizing solution.

24. The planarizing machine of claim 23 wherein:

the support comprises an elongated arm and a fluid passageway carried by the arm through which a planarizing solution can flow, the arm having a first section and a second section; and

the dispenser further comprises a first nozzle at the first section and a second nozzle at the second section, the first nozzle being in fluid communication with the fluid passageway to discharge a first flow of the planarizing solution onto a first location of the pad, and the second nozzle being in fluid communication with the fluid passageway to discharge a second flow of the planarizing solution onto a second location of the pad, wherein the first and second fluid discharge units are independently controllable from one another.

25. A planarizing machine, comprising:

a table having a support surface;

a processing pad on the support surface;

a carrier assembly having a head configured to hold a microelectronic workpiece and a drive assembly carrying the head; and

a solution dispenser having an elongated opening along the fluid conduit through which a planarizing solution can flow.

26. A planarizing machine, comprising:

a table having a support surface;

a processing pad on the support surface;

a carrier assembly having a head configured to hold a microelectronic workpiece and a drive assembly carrying the head; and

a solution dispenser having an elongated weir over which a planarizing solution can flow.

27. A planarizing machine, comprising:

a table having a support surface;

a processing pad on the support surface;

a carrier assembly having a head configured to hold a microelectronic workpiece and a drive assembly carrying the head;

a solution dispenser having a first fluid discharge unit over a first area of the pad and a second fluid discharge unit over a second area of the pad spaced apart from the first area, the first and second discharge units having independently controllable flow rates of a planarizing solution; and

a controller coupled to the solution dispenser, the controller selecting a first flow rate of planarizing solution for the first discharge unit and a second flow rate of planarizing solution for the second discharge unit.

28. The planarizing machine of claim 27 wherein:

the support comprises an elongated arm and a fluid passageway carried by the arm through which a planarizing solution can flow; and

the first discharge unit being configured to discharge a first flow of the planarizing solution onto a first location of the pad, and the second discharge unit being configured to discharge a second flow of the planarizing solution onto a second location of the pad, wherein the first and second fluid discharge units are independently controllable from one another.

29. The planarizing machine of claim 27 wherein:

the support comprises an elongated arm and a fluid passageway carried by the arm through which a planarizing solution can flow; and

the first fluid discharge unit comprises a first nozzle and the second fluid discharge unit comprises a second nozzle, the first nozzle being in fluid communication with the fluid passageway to discharge a first flow of the planarizing solution onto a first location of the pad, and the second nozzle being in fluid communication with the fluid passageway to discharge a second flow of the planarizing solution onto a second location of the pad, wherein the first and second fluid discharge units are independently controllable from one another.

30. A method of processing a microelectronic workpiece, comprising:

removing material from the workpiece by pressing the workpiece against a contact surface of a processing pad and imparting relative motion between the workpiece and the contact surface;

depositing a first flow of a planarizing solution from a dispenser directly onto a first region of the contact surface; and

depositing a second flow of the planarizing solution from the dispenser directly onto a second region of the contact surface separate from the first region.

31. The method of claim 30 wherein:

the dispenser comprises a support, a first nozzle at a first section of the support, and a second nozzle at a second section of the support; and

depositing a flow of the planarizing solution comprises discharging planarizing solution through the first and second nozzles at a common flow rate, the first nozzle discharging the first flow and the second nozzle discharging the second flow.

32. The method of claim 30 wherein:

the dispenser comprises a support, a first elongated slot along a first section of the support, and a second elongated slot along a second section of the support; and

depositing the flow of the planarizing solution comprises discharging planarizing solution through the first and second slots at a common flow rate, the first slot discharging the first flow and the second slot discharging the second flow.

33. The method of claim 30 wherein:

the dispenser comprises a support, a first discharge unit at a first section of the support, and a second discharge unit at a second section of the support; and

depositing the flow of the planarizing solution comprises discharging planarizing solution through the first and second discharge units, the first discharge unit discharging the first flow and the second discharge unit discharging the second flow.

34. The method of claim 30 wherein:

the dispenser comprises a support, a first discharge unit at a first section of the support, and a second discharge unit at a second section of the support; and

depositing the flow of the planarizing solution comprises discharging planarizing solution through the first and second discharge units, the first discharge unit discharging the first flow at a first flow rate and the second discharge unit discharging the second flow at a second flow rate different than the first flow rate.

35. The method of claim 30 wherein:

depositing the flow of the planarizing solution comprises discharging planarizing solution through a first discharge unit and a second discharge unit, the first discharge unit discharging the first flow and the second discharge unit discharging the second flow; and

controlling the first and second flow rates independently from one another.

36. The method of claim 30 wherein:

depositing the flow of the planarizing solution comprises discharging planarizing solution through a first nozzle and a second nozzle, the first nozzle discharging the first flow at a first flow rate and the second nozzle discharging the second flow at a second flow rate; and

controlling the first and second flow rates independently from one another.

37. The method of claim 30, further comprising controlling the first flow independently from the second flow.

38. The method of claim 30, further comprising:

sensing a planarizing parameter while removing material from the workpiece; and

controlling the first and second flows according to the sensed planarizing parameter.

39. The method of claim 30 wherein:

depositing the flow of the planarizing solution comprises discharging planarizing solution through a first discharge unit and a second discharge unit, the first discharge unit discharging the first flow and the second discharge unit discharging the second flow; and

the method further comprises (a) sensing a planarizing parameter associated with removing material from the workpiece, and (b) controlling the first and second flows according to the sensed planarizing parameter.

40. The method of claim 39 wherein sensing a planarizing parameter comprises measuring a plurality of temperatures at points across the processing pad.

41. The method of claim 39 wherein sensing a planarizing parameter comprises measuring a plurality of pressures at points across the processing pad.

42. The method of claim 29 wherein sensing a planarizing parameter comprises measuring drag force between the processing pad and the workpiece.

43. A method of processing a microelectronic workpiece, comprising:

removing material from the workpiece by pressing the workpiece against a contact surface of a processing pad and imparting relative motion between the workpiece and the contact surface; and

discharging a planarizing solution directly onto a first region of the contact surface and concurrently discharging the planarizing solution directly onto a second region of the contact surface separate from the first region, the

planarizing solution being deposited onto the first and second regions separate from a head carrying the workpiece.

44. The method of claim 43 wherein discharging the planarizing solution onto the pad comprises discharging planarizing solution through a first discharge unit at the first region of the pad and discharging planarizing solution through a second discharge unit at a second region of the pad.

45. The method of claim 43 wherein discharging the planarizing solution onto the pad comprises discharging planarizing solution through a first nozzle at the first region of the pad and a second nozzle at the second region of the pad.

46. The method of claim 43 wherein:

the planarizing solution is discharge through a dispenser having a support and an elongated slot extending along at least a portion of the support; and

discharging the planarizing solution onto the pad comprises passing a flow of planarizing solution through the slot.

47. The method of claim 43 wherein:

the planarizing solution is discharge through a dispenser having a support and an elongated weir extending along at least a portion of the support; and

discharging the planarizing solution onto the pad comprises passing a flow of planarizing solution over the weir.

48. The method of claim 43 wherein discharging the planarizing solution onto the pad comprises discharging a first flow of planarizing solution onto

the first region of the pad and discharging a second flow of planarizing solution onto the second region of the pad.

49. The method of claim 43 wherein discharging planarizing solution onto the pad comprises discharging planarizing solution through first and second discharge units, the first discharge unit discharging a first flow at a first flow rate and the second discharge unit discharging a second flow at a second flow rate different than the first flow rate.

50. The method of claim 49, further comprising controlling the first and second flow rates independently of each other.

51. The method of claim 49, further comprising:

sensing a processing parameter associated with removing material from the workpiece; and

controlling the first and second flow rates independently from each other according to the sensed processing parameter.

52. The method of claim 43 wherein discharging the planarizing solution comprises (a) passing the planarizing solution through a fluid discharge unit that is moveably carried by a support over the processing pad and (b) concurrently moving the fluid discharge unit relative to the support to discharge the planarizing fluid at different regions across the contact surface.

53. The method of claim 52 wherein moving the fluid discharge unit comprises sliding the fluid discharge unit along the support.

54. The method of claim 52 wherein moving the fluid discharge unit comprises rotating the fluid discharge unit about a pivot point on the support.

55. A method of processing a microelectronic workpiece, comprising:

removing material from the workpiece by pressing the workpiece against a contact surface of a processing pad and imparting relative motion between the workpiece and the contact surface;

discharging a planarizing solution directly onto a first region of the contact surface and a second region of the contact surface separate from the first region;

sensing a parameter of removing material from the workpiece; and

controlling a first volume of planarizing solution discharged onto the first region independently from a second volume of planarizing solution discharged onto a second region.